PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : B67D 1/08, B65D 25/02

A1

(11) International Publication Number: WO 94/15871

(43) International Publication Date: 21 July 1994 (21.07.94)

(21) International Application Number: PCT/GB94/00022

(22) International Filing Date: 6 January 1994 (06.01.94)

(30) Priority Data:
9300143.6 6 January 1993 (06.01.93) GB

(71) Applicant (*for all designated States except US*): CARLSBERG TETLEY BREWING LIMITED [GB/GB]; 107 Station Street, Burton-on-Trent DE14 1BZ (GB).

(72) Inventor; and
(75) Inventor/Applicant (*for US only*): RASUMUSSEN, Jan, Norager [DK/DK]; Carlsberg Research Centre, DK-2500 Valby (DK).

(74) Agent: FRANK B. DEHN & CO.; Imperial House, 15-19 Kingsway, London WC2B 6UZ (GB).

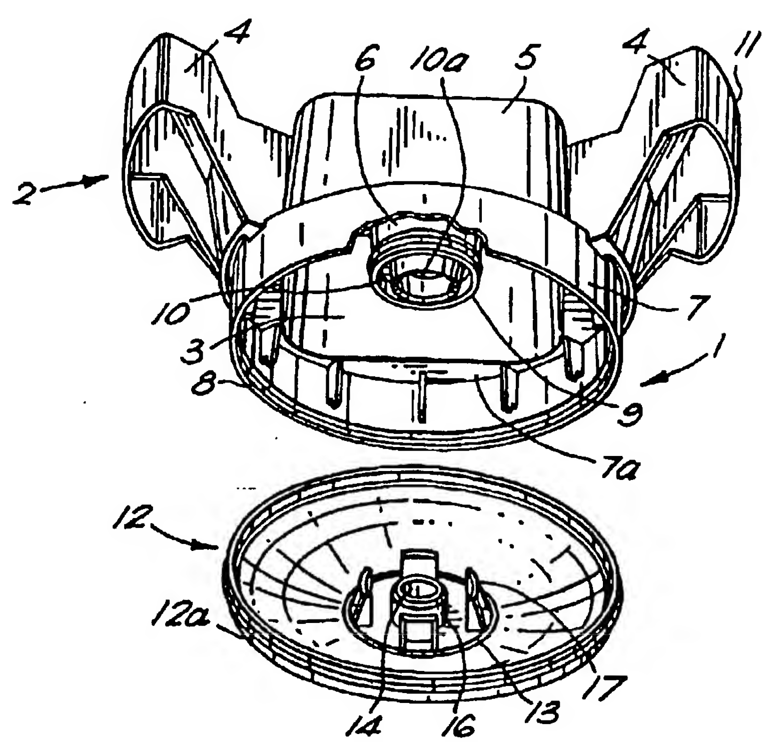
(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: FOAM PRODUCTION

(57) Abstract

An insert (1) for positioning in a container of beverage such as beer which is to be sealed under pressure. In use, the insert is filled with gas and/or beverage which is released from the insert in order to generate foam in the beverage when the container is opened. The insert is formed from two mouldings (2, 12) which snap together. One of the mouldings (12) is deformable between a convex and a concave configuration. Apertures (10a, 14) are provided in each moulding so that when the moulding (12) is in its convex configuration, communication is provided via the apertures into the insert. When the moulding (12) is in its concave configuration this communication is substantially restricted, leaving only a small passage (14a). In use, a jet of gas is released from the insert via this aperture in order to cause the production of foam in the beverage. The invention also extends to a method of filling the insert (1) with nitrogen gas.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgystan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

FOAM PRODUCTION

This invention relates to the production of foam and is particularly but not exclusively concerned with the production of a head of beer dispensed from bottles, cans and the like.

Whilst many systems exist for ensuring a good, stable, tight head on draught beer which is dispensed from casks and other bulk containers, it has long been recognised that there are problems if seeking to achieve the same effect on beer dispensed from cans and bottles. Such containers are vented to atmosphere when opened by e.g. removing a tab or cap. Any head tends to come from the natural effervescence of the beer as dissolved carbon dioxide comes out of solution, and from excitation of the beer as it is poured into a glass. To a certain extent the head formation can be improved by using a combination of nitrogen and carbon dioxide, but simply doing this does not produce a head as good as that on draught beers. There is a particular problem in the case of canned beers intended to provide similar qualities to traditional draught beers, where there is a significantly lower CO_2 content than in other canned beers.

In GB-A-1,266,351 there is disclosed the use of a secondary chamber in a can or bottle. This contains gas at above atmospheric pressure. In one arrangement the chamber is in permanent communication with the main body of beer. When the bottle or can is opened, the gas is ejected from the secondary chamber as a result of the excess pressure over atmospheric pressure and this initiates bubble formation.

In GB-A-2,183,592 there is disclosed a system in which beer is said to enter a secondary chamber containing gas, and it is stated that ejection of this beer initiates bubble formation.

In GB-A-1,266,351 and GB-A-1,331,425 there are also disclosed systems in which a secondary chamber is provided with a valve

which will open when the container is vented to atmosphere, gas under pressure being injected into the primary chamber.

In WO-A-91/07326 there is disclosed a secondary chamber which is charged with nitrogen under pressure, prior to insertion in the can. A valve is provided which initially stays closed against the pressure differential. After insertion in the can, and sealing of the can, the valve properties are altered and it will open when subsequently exposed to the pressure differential again when the can is opened.

A commercially available can of beer marketed in the United Kingdom contains an insert which is said to be in accordance with GB-A-2,183,592. Another commercially available can of beer marketed in the United Kingdom contains an insert which is said to be in accordance with WO-A-91/07326. Both of these inserts are of relatively complex construction. In the case of the first mentioned insert it is believed that a multi-stage flushing process with nitrogen is necessary, after insertion into the can, to ensure the absence of oxygen which might taint the beer. In the case of the second mentioned insert, it is a two part moulding which has been filled with nitrogen or another suitable gas before insertion.

Known secondary chamber designs in commercial use are of relatively complex construction and present difficulties in terms of handling and filling with gas.

An object of an invention disclosed herein is to provide an insert which is more readily able to be filled with gas such as carbon dioxide, nitrogen, a mixture of the two, or another suitable "inert" gas.

Thus, according to an invention disclosed herein there is provided a hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into

the beverage in the container when the container is opened, so as to promote the formation of foam, wherein the insert comprises first and second portions which are joined together and movable relative to each other from a first position in which there is access to the interior of the insert through at least one relatively large opening provided in one of the portions, to a second position in which the insert is substantially sealed.

By "substantially sealed" is meant that the insert is in its normal operative condition, in which there may be a permanent but small aperture or e.g a valve, as in the prior art devices.

Thus, in use the portions are initially in the first position and it is a simple matter to fill the insert with gas. This may be done by means of an injection tube or the like passing through the large opening, or it may be done by evacuating and flushing the insert and the beverage container with gas as in the prior art system. In the latter case, the large opening considerably facilitates the flushing of the insert. When the insert is full with the desired gas, the two portions are moved together so as to seal the insert. The filling and sealing operations may be performed inside the beverage container, for example as part of an insertion operation, or may be carried out prior to positioning the insert in the container.

In WO-A-91/07326 there are disclosed various types of insert in two parts. In use, one of these is completely open and is filled with gas before the other is attached to it as a sealing cap, and neither part has an opening through which gas can be passed into the insert after the parts are joined together.

In a preferred embodiment of this present invention, one of the portions has a relatively large aperture which is

positioned opposite a spigot on the other portion. When the two portions are pushed together, the spigot enters and seals the aperture. The spigot itself may be provided with an axial opening, so that there is the option of filling the insert from either direction. Such an arrangement of two openings may be possible in other cases also. When two openings are provided, when the insert is sealed there will be a passage passing from one side to the other; this may be advantageous as it will permit a flow of beverage during filling so as to assist in filling the beverage container underneath the insert.

When the insert is filled with gas by means of a tube, the arrangement should preferably be such that the tube is in sealing engagement with the opening through which it passes. In the case of there being two openings, the tube preferably seals the other opening also. In this manner, it is possible to use the tube firstly to evacuate air from within the insert, and then to inject the inert gas such as nitrogen. A single such cycle will be sufficient. If there is no such sealing, simply flushing the insert through with gas may though be sufficient. By evacuating air from the insert, the insert can be held onto the tube which assists in handling of the insert.

According to a further invention disclosed herein there is provided a method of inserting a significantly air free, gas filled hollow enclosure into a container for beverage, where gas and/or liquid is subsequently to be ejected from the enclosure into the beverage. In general, the enclosure would be full of an "inert" gas such as nitrogen. The method of this further invention comprises the steps of passing a tube into the enclosure in sealing engagement with an opening; applying a reduction in pressure to the enclosure through the tube, whereby to obtain significant removal of air from the enclosure and to attach the enclosure to the tube; positioning the enclosure in the container whilst attached to the tube;

ceasing application of the reduction in pressure; passing a gas into the enclosure by means of the tube; and withdrawing the tube from the enclosure.

A gas injection tube arrangement may also be used to urge the two insert portions together after filling with gas.

Means are preferably provided to keep the two portions together in the second position after filling and being urged together. This could be by way of adhesive, heat bonding and the like. Preferably, however the two portions snap or press fit together. One of the portions may deform from e.g a convex dished state in the first position to a concave dished state in the second position to help keep the portions engaged together.

Where the insert is to have a small permanent opening through which gas and/or beverage is to be ejected in use, this may be provided in one of the portions in advance. Preferably, however, the opening is defined when the two portions are urged together and is a small gap between them. Thus in the case of a spigot extending into an aperture, there could be a narrow space around the spigot. Alternatively, the spigot could be sealed into the aperture around most of its circumference, save one or more points where an opening is to be provided. At such point(s) one of the portions could be provided with a groove or the like.

In one preferred embodiment one of the portions has a centrally disposed axially extending spigot, received in an aperture in the other member. The aperture itself is in the form of a tube. One of the spigot and tube has a longitudinally extending groove which defines, with the wall of the other, a longitudinally extending orifice through which the gas and/or beverage will be ejected. The groove may for example be in the form of a "V" notch with a 90° angle, approximately 0.3 mm deep. The orifice may open out in the

direction of gas/beverage flow. This can be achieved by tapering the cross section of the tube or spigot in the longitudinal direction, e.g making it of frustoconical form. The groove may be formed by means of a suitable precision tool before the portions are assembled together.

In a preferred embodiment, the insert comprises a first portion in the form of a chamber having a first closed end, a central hollow tube extending from the first end to the other end and having an axial opening at both ends, and a second portion in the form of a flexible cap sealed around its periphery to the first portion at said other end, the second portion having a central spigot axially aligned with the tube, and the second portion being deformable so that the spigot moves axially from a first position in which it is not in sealing engagement with the tube, to a second position in which the spigot is in sealing engagement within the tube.

In the preferred embodiment the first and second portions are initially joined together, and supplied in such a manner but with the spigot in the first position. The join between the portions may be a press fit although adhesives, welding and so forth could be used.

The general construction of such an arrangement has advantages even if the two portions are not initially joined together, and the cap is simply pressed into place, simultaneously forming a circumferential seal and the seal between the spigot and tube. A particularly advantageous arrangement is when such a system is used in the context of an insert having a permanent opening.

According to a further invention disclosed herein, there is provided a hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so

as to promote the formation of foam, wherein the insert comprises a first portion in the form of a chamber having a first closed end, a central hollow tube extending from the first end to the other end and having an axial opening at both ends, and a second portion in the form of a cap sealed around its periphery to the first portion at said other end, the second portion having a central spigot extending axially into the tube and forming a seal therewith, and there being defined between the spigot and the tube at least one axially extending orifice through which there will be the flow of gas and/or beverage into the beverage in the container when the container is opened.

Preferably the spigot is hollow whereby there is provided a passage through the insert.

Preferably the tube is tapered, with increasing cross section in the direction away from the spigot. The tube may have a first relatively short portion of a first diameter (or in the case of a taper, range of diameters) which receives the spigot, and a second longer portion of a second, greater diameter (or in the case of a taper, range of diameters).

In use, if the insert is positioned towards the bottom of a beverage container such as a can, the first portion will be uppermost with the tube pointing up the container.

The insert may be formed of any suitable plastics material such as food grade HDPP (High Density Polypropylene), and the two portions may be moulded by any suitable technique such as injection moulding. They may be sealed around the periphery by means of a press fit, adhesive, thermal or ultrasonic welding, or by any other suitable technique. The material of the insert will generally have a degree of resistance.

The insert may be located inside a container by any suitable means. Preferably it is provided with a pair of laterally

extending resilient wings of plastics material which will engage the interior wall of the container. The wings will have a natural extent exceeding the diameter of the container. The insert could be passed into the container by means of a tapering guide tube which will compress the wings inwardly, the wings subsequently pressing out to grip the container wall. The wings may be formed integrally with the first portion. The wings preferably have apertures therein to assist when filling the container, to permit free flow of beverage and prevent gas pockets forming.

In one embodiment the wings are relatively rigidly attached to the main chamber part of the insert, whilst providing sufficient resilience to permit the insert to be forced into a can or the like. In the preferred embodiment, however, the wings are resiliently hingedly attached towards the bottom of the insert. Preferably, the hinges permit the wings to fold up from a lateral position to a vertical position, against the main body of the insert. This reduces to a minimum the cross section of the insert and facilitates insertion. In this embodiment, the extremities of the wings are preferably provided with lugs positioned below the plane of the hinge. By the arrangement, once the insert is positioned in the can, removal will be resisted by these lugs engaging the can wall.

It will be appreciated that with the preferred embodiment, whilst the orifice communicating the interior of the insert with the beverage may be towards the bottom end of the insert, it can nevertheless direct the gas and/or beverage upwardly in an axial direction. This may be advantageous.

Accordingly, in accordance with a further invention disclosed herein there is provided a hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so as to promote the formation of foam, wherein

there is provided a relatively wide passage extending downwardly through the insert, which at its upper end is open to communicate with the main body of beverage within the container and at its lower end communicates with the interior of the insert through at least one relatively fine orifice through which there will be the flow of gas and/or beverage into the beverage in the container when the container is opened.

Preferably the passage is also open adjacent its other end, and preferably the wall of the passage tapers inwardly from the upper to the lower end. Preferably the fine orifice extends parallel to the axis of the passage, for example from a step towards the lower end of the passage. The orifice could be in the form of a fine annular gap.

In the most preferred embodiments, filling of the inserts is carried out by a tube by an effective and simple manner.

Thus, according to a still further invention disclosed herein there is provided a method of filling with gas a hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so as to promote the formation of foam, wherein the insert comprises first and second portions which are joined together and movable relative to each other from a first position in which there is access to the interior of the insert through at least one relatively large opening provided in one of the portions, to a second position in which the insert is substantially sealed, the filling method comprising the steps of positioning a filling tube through the relatively large opening whilst the portions are in the first position, injecting gas into the insert through the filling tube, moving the portions into the second position, and withdrawing the filling tube from the insert.

Preferably, the method comprises the further step of evacuating the insert through the filling tube, prior to injecting gas.

Preferably the filling tube has laterally extending orifices to inject the gas into the insert. As noted earlier, it may seal the opening or, if there are two openings, both of them.

To urge the two portions together, any suitable means may be employed. In one arrangement, the insert is urged downwardly against the base of the container, this serving to push the portions together. In the case of an aluminium or other thin walled can, this may require supporting the base of the can on the outside.

Even where there is to be a permanent orifice, it will be practicable to fill the insert in advance of covering with beverage, so that insertion, filling and closing of the insert may be carried out at an earlier stage in the process either inside the container or separately. Little air will penetrate the insert in the time intervals likely to be encountered in practice.

In the case of using a permanent orifice the position of the orifice and the volume and arrangement of the insert have to be considered carefully. In such an arrangement the orifice provides a permanent communication between the secondary chamber and the main body of beverage, and beverage will enter the insert. The arrangement could be as described as in GB-A-2,183,592, in which it is alleged that ejection of beverage initiates foam formation. However, it has been found that it is advantageous to position the orifice to have an alternative effect.

It has now been ascertained that froth initiation by ejection of gas such as nitrogen, carbon dioxide or a mixture of the two, can be achieved in a simple manner which does not require

complex manufacturing conditions. The term "inert gas" used herein refers to such gases and any other suitable gases which will not taint beer. The insert is therefore preferably provided with the orifice at a position such that there will be, below the level of the orifice, a substantial volume in which beer will be trapped.

In this preferred method, the insert initially contains gas at atmospheric pressure and is in permanent communication with the body of the container. The container is filled with beverage which will usually be at a temperature lower than a normal dispensing temperature and typically close to 0°C. The beverage is supersaturated with gas, containing carbon dioxide and nitrogen; the nitrogen may be obtained at least in part by dosing the can with liquid nitrogen. Additionally or alternatively the beverage may be pre-nitrogenated. The container is sealed and the pressure inside rises as a result of evolution of the gas from the beverage and the liquid nitrogen dosing if applicable. The beverage enters the insert through the orifice to compress the gas therein. The orifice is spaced from the bottom of the insert by a distance sufficient to define below the orifice a substantial reservoir.

The orifice is portioned such that the liquid beverage entering the insert will fill the reservoir and cover the opening. Gas will be trapped and compressed above the beverage in the insert.

In practice, pressure in the container at the time of opening will also have risen due to temperature effects. Whilst filling and sealing may have been carried out at about 0°C, consumption may take place at about 7-10°C, say 8°C, or even at room temperature at about 20°C.

When the container is vented to atmosphere, the gas in the insert first expels liquid beverage through the orifice, until

the level drops to uncover the orifice. At this point the gas is still under significant pressure because the free volume of the insert is reduced by the volume of liquid trapped in the reservoir below the level of the orifice. Thus, the original mass of gas in the insert occupies a smaller volume. The gas is ejected through the orifice until its pressure drops to atmospheric. In a simple case, the volume ejected (at atmospheric pressure) wil be approximately equal to the volume of trapped beverage in the reservoir.

In such an arrangement the liquid beverage itself does not initiate significant bubble formation to an extent sufficient to generate a head. The jet of gas which is ejected subsequently causes the bubble formation. The arrangement may be such that a relatively small quantity of liquid is above the orifice before the container is opened, so that it is disposed of rapidly before the gas is ejected. With such an arrangement, there may be an additional initial effect in which some gas forces its way through the layer of liquid above the orifice, as soon as the container is opened. This causes foam to be ejected, and gives rise to bubble initiation in the beverage in the container even before the main quantity of gas is ejected through the orifice.

Furthermore, as the gas is ejected through the orifice, it passes over the trapped liquid in the reservoir. This may lead to some foam being ejected through the orifice together with the main body of gas.

Experiments have shown that ejection of gas in this manner, preferably with the foam, rather than ejection of liquid, gives significant bubble formation and leads to a good head on beverages such as beer and stout which are dispensed from cans or bottles.

Thus, in the preferred embodiments a simple orifice is provided in the tubular insert at a position between the top

and bottom extremities. The orifice is preferably on the side which will point inwardly to the centre of the container. The orifice may be provided by drilling, laser boring, punching or as part of the initial forming process.

The orifice is preferably positioned such that between 25% and 75% of the volume of the chamber is below the level of the orifice. A preferred range is 30% to 40%, in particular around 50%.

A preferred total internal volume of the secondary chamber, for conventional beer can sizes in the range of 275 ml to 500 ml, is in the range of 10 ml to 20 ml. A preferred size is about 15 ml to 16 ml, which is appropriate for a number of sizes including 440 ml and 500 ml containers.

After the container has been filled and sealed it may then be pasteurised. Preferably, pasteurisation is carried out with the can inverted, as is common practice in the brewing industry. Preferably the quantity of beverage in the container and the location of the orifice in the insert are arranged such that during inverted pasteurisation the interior of the insert is in communicatin with the head-space via the orifice. It is believed that this may improve performance of the insert by increasing the volume of gas trapped therein.

As noted above, there may be initial effects in which gas is punched through the beverage in the insert. These may be undesirable and it may be desired to have a more gradual effect. This may particularly be the case where it is wished to avoid adverse temperature dependent effects.

By making the walls of the insert from sufficiently flexible material, when the container is first opened and the pressure drops to atmospheric, any initial potentially "explosive" effect within the insert can be avoided. Instead of the contents of the insert being blown suddenly out of the insert,

the walls of the insert expand outwardly momentarily under the action of the pressure difference. This increases the internal volume of the insert momentarily, and thereby absorbs some of the initial effect.

According to another invention disclosed herein there is provided a method of promoting the formation of foam upon opening a container of beverage containing gas in solution and sealed under pressure, wherein there is provided within the container an insert adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, as a result of a pressure difference between gas in the insert and atmospheric pressure, and wherein a major part of the volume of the insert is bounded by a wall which whilst resistant to collapse is sufficiently flexible such that upon opening the container a sudden initial pressure difference is absorbed in part by transient flexing of the wall to increase the volume of the insert, so as to prevent excessive sudden expulsion of the contents of the insert, whereafter there is controlled ejection of the gas and/or beverage to promote foam formation.

Such an arrangement can considerably reduce unwanted temperature effects. Existing systems tend to work reliably only at low temperatures and it is recommended that the beverage be chilled. At higher temperatures, the pressure in the container and insert is higher, and there can be an initial very explosive effect when the container is opened, as the contents of the insert are expelled suddenly. By the means described above, such initial effects are absorbed and in suitable cases it is feasible to open the container at normal ambient temperatures. Furthermore, in the preferred system there is in any event substantial ejection of beverage before the foam promoting gas (or gas and beverage) and this also dissipates energy and helps to reduce the problems when opening the container at higher temperatures.

Providing a flexible wall may also make it possible to vary the volume of the insert by a manual operation to as to effect a "pumping" action. This may be achieved by for example squeezing the sides of a thin walled aluminium can one or more times, so that members such as the supporting wings described earlier act on the wall of the insert. Such an action may permit additional pumping of gas and/or beverage into the main body of beverage to facilitate foam formation on a second occasion. Thus, when pouring out a second glass of beer for example a better head may be obtained than with existing arrangements.

As noted earlier, the insert may be provided with a valve type of arrangement which opens when the container is opened, rather than a permanently open orifice. This can be achieved in the region of the join between the spigot and tube in the preferred embodiment, so that a valve seat is formed. This valve could operate in a known manner. However a preferable arrangement would be one in which there is manual control over the valve. Thus, whether the insert is used or not could then be at the choice of the consumer. There would also be the possibility of controlling the flow from the insert. Such an arrangement could for example be provided by means of the wings referred to above such that upon squeezing the sides of a can there is distortion of the insert and opening of the valve.

Thus according to another invention disclosed herein there is provided a container of beverage sealed under pressure, the container having a flexible wall and having therein a hollow insert adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so as to promote the formation of foam, there being a valve to control the flow of gas and/or beverage from the insert, and there further being movable portions of the insert which engage the flexible wall of the container and whose movement control the opening and/or closing of the valve, whereby a

user can control the valve by pressure on the flexible wall of the container.

Some arrangements embodying a number of the above features will now be described by way of example and with reference to the accompanying drawings in which:-

Fig. 1 is an exploded perspective view of the insert.

Fig. 1a is a view of part of the insert to show a groove which defines an orifice.

Fig. 2 is a vertical section of the insert in one configuration.

Fig. 3 is a vertical section of the insert in another configuration.

Fig. 4 is a vertical section of the insert being filled with gas.

Figs. 5a-5d are vertical sections of a can of beverage containing the insert showing the flow of fluid into and out of the insert.

Fig. 6 is a view showing an evacuation and gas filling tube engaged in the insert.

Fig. 7 is a plan view of part of a second embodiment of insert.

Fig. 8 is a section through this part.

Fig. 9 is a side view of this part.

Fig. 10 is a section through a second part of this embodiment of insert.

Fig. 11 is a plan view of this second part.

Fig. 11(a) is a detailed view of a portion of Fig. 11.

Fig. 12 is a section through this embodiment of insert, with the parts in a first position.

Fig. 13 is a section with the parts in a second position.

Fig. 14 is a sectional view of insertion and gas filling apparatus.

Fig. 15 is an enlarged sectional view through this apparatus.

Referring to Fig. 1, the insert 1 is made from two pieces of injection moulded, resilient plastics material, such as food grade high density polypropylene. The main, upper part 2 of the insert has a chamber 3 and two wings 4.

The chamber is defined by a generally cuboid-shaped portion 5 in the centre of which is a hollow tube 6 of tapering circular cross-section.

Below the cuboid portion 5 there is a downwardly extending skirt 7 joined to the cuboid portion by a horizontal flange 7a. At the lowermost part of the flange there is an internal groove 8 which forms part of a snap-fit mechanism which is used to connect the two parts of the insert together in a sealing fashion around their circumferences.

The base of the tube 6 is generally level with the flange 7a and has two concentric, circular lips thereon. The outer lip 9 is provided with an annular rib 9a projecting from its outer wall. The inner lip 10 defines a hole in the base of the tube 6 and tapers outwardly in the upwards direction. The lips co-operate with parts of the lower piece in a manner discussed below.

The purpose of the wings 4 is to locate the insert within a beverage container such as a beer can. Their outer faces 11 are therefore curved as shown in Fig. 1 and have a similar radius of curvature to that of the container in which the insert is to be used. The wings 4 extend from the cuboid portion 5 on opposite sides thereof. Because of the resilient nature of the material used, the insert 1 will wedge inside a container with the outer faces of the wings pressing against the inner walls of the container.

The second moulded piece 12 forms the base of the insert. It is generally disc-shaped and has an outer rim 12 with a lip 12a which provides a sealing snap-fit into the groove 8 of the

main piece 2 (as illustrated in the remaining figures). This piece has two stable configurations. These are assisted by incorporating an annular groove 13 into the disc which assists the disc to snap between positions. In the first position (as shown in Fig. 1) the disc is concave downwards. This an open configuration in which the insert is assembled. In the second configuration (as shown in Figs. 3 and 5a-d), the disc is concave upwards to a closed configuration. These configurations are discussed in more detail below in relation to figures 2 and 3.

In the centre of the disc there is a hollow spigot 14, open at both ends, having an external diameter approximately equal to the interior diameter of the hole through the base of the lip 10 in the centre of the main piece, so that the spigot can form a sealing press fit within the tube. Around the aperture at the lower end of the spigot are projections 15 on the outer face of the disc which may be used to space the insert slightly from the base of a container in which it is placed.

Disposed around the spigot on the inside face of the disc there are four further projections 17. When the insert is assembled and the disc is in the closed configuration, grooves 17a on these projections form a snap fit with the rib 9a, thus holding the centres of the two pieces together.

The spigot 14 is provided with a longitudinally extending "V" shaped groove 14a shown more clearly in Fig. 1a. This is about 0.3mm deep and has a right angle base. It is this that will provide the orifice for gas and beverage discharge in the manner described below.

An assembled insert with the disc in the open configuration is illustrated in Fig. 2. From this figure it may be seen that the chamber is closed except for the openings provided by the apertures in the spigot and tube.

Once the insert has been assembled it may be filled with an "inert" gas such as nitrogen, carbon dioxide or a mixture of the two. This process is illustrated in Fig. 4. A tube 18 connected to a supply of gas is inserted through the spigot from the bottom. The tube has a closed upper end and laterally directed holes 19 near its upper end to allow the gas to flow out sideways into the insert. The insert is flushed with inert gas in this manner in order to remove oxygen which would taint a beverage such as beer.

After flushing the insert, the second part of the insert is pushed upwards into its second configuration substantially to close the chamber, as shown in Fig. 3. In this configuration the spigot on the second piece fits closely within the lip 10 on the first piece, to form a seal around most of the circumference. The exception is that the groove 14a forms a longitudinal, upwardly directed fissure communicating the chamber with the outside. Since the lip 10 tapers, the fissure opens outwardly in the upwards direction.

The grooves 17a on the projections 17 of the lower piece form a snap fit with the rib 9a on the lip 9 of the main part to hold the two pieces together in this "closed" configuration. The annular projections have spaces between them so that there is free access for beverage and gas within the chamber to reach the groove 14a when the gas and/or beverage is to be ejected.

Below the groove 14a there is a significant volume of the chamber, and this provides the effect described later.

The illustrated insert is most suitable for use with canned beer. The insert is located within a standard beer can, as shown in Figs. 5a-d and the can is filled and immediately sealed in the conventional manner. Beer containing carbon dioxide gas in solution is tapped into the can at a temperature just above its freezing point. The beer is able

to flow freely around the insert. Holes 21 in the top of the ears prevent the formation of air pockets thereunder and beer can also pass down through the tube in the centre of the insert. A head-space is left above the beer. Fig. 5a shows an insert immediately after the can has been filled.

When the can has been sealed, gas evolving from solution builds up in the head-space causing a rise in pressure. There may also be dosing of the head-space with liquid nitrogen. The pressure will also increase as the can is allowed to reach storage temperature and more gas comes out of solution. The increase in pressure inside the can forces beer into the insert via the fissure provided by groove 14a (see Fig. 5b). This will continue until a pressure equilibrium is reached between the inside of the insert and the remaining part of the inside of the can. The result of this is the insert becomes partly filled with beer and partly with compressed gas, as shown in Fig. 5c. If the can is pasteurised in its upright position, a further build-up of pressure occurs, leading to even greater amounts of beer entering the insert, but this effect is reversed upon cooling. However, as discussed previously, the can may be inverted for pasteurisation. In this case gas from the head-space may flow directly into the insert, thereby increasing the final volume of gas in the insert.

If the gas in the container is assumed to be ideal, the following condition is satisfied:-

$$\frac{PV}{T} = \text{constant or } \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

where:

P = Pressure

V = Volume

T = Temperature (in degrees Kelvin)

In a typical case, the volume of the insert is 15.7ml and the can is filled at approximately 0°C, or 273K. The CO_2 level is equivalent to 1.00 V/V (at s.t.p) at equilibrium. The Nitrogen level is equivalent to 72.0 mg/litre at equilibrium. After sealing, the pressure inside the can rises to 3.08 bar (absolute). As the insert is originally at atmospheric pressure (1 bar absolute), the new volume of gas inside the insert, after equilibrium is reached at 0°C will be:-

$$V_2 = \frac{(1\text{bar}) \times (15.7\text{ml})}{(3.08 \text{ bar})}$$

$$= 5.1\text{ml}$$

There is, therefore, 15.7-5.1 = 10.6ml of beer inside the insert.

As the temperature rises, there will be an increase in pressure leading to an increased volume of beer inside the insert. At 4°C, 8°C and 20°C the pressures (bar absolute) would be 3.22, 3.37 and 3.85.

As noted above the fissure provided by groove 14a is displaced above the lowest part of the chamber and there is a significant volume of the chamber below it. This volume acts as a "reservoir" of beer. In fact, 5.4ml of the volume of the chamber is below the fissure, so that at least 5.2ml of beer is above it in this example.

When the can is broached, a sudden de-pressurisation occurs and the pressure inside the can drops to 1 bar. This results in a pressure differential between the can and the insert which, in turn, results in the gas in the insert expanding. Since beer is inside the insert above the fissure, this is driven out by the expanding gas. This is shown in Fig. 5c. The streaming beer may cause a very limited amount of foam production, but its main effect is to delay the release of gas. There is also a transient increase of the volume of the

chamber, caused by bowing out of the flexible walls of the cuboid portion and this helps reduce unwanted initial effects.

Once the beer drops to level with the fissure, gas or a gas-beer mixture streams out as shown in Fig. 5d and most of the beer below the fissure remains in the insert. The gas form streaming out of the insert rapidly produces a large amount of foam, such that when the beer is poured from the can an attractive, creamy head is produced. The amount of gas which flows out is roughly equal to the amount of beer left inside the insert.

In practice these theoretical figures will not be achieved due to transient effects and the gas "carrying" some beverage with it. However, they serve to illustrate the principle of how firstly liquid and then gas is ejected.

The filling and closing of the insert in the above embodiment may be performed outside of the can, and involves flushing through with gas. In an alternative arrangement shown in Figure 6, an evacuation and filling technique is used and this may be particularly advantageous if filling the insert when in the can.

In this embodiment an evacuation and gas injection tube 22 is pushed into the insert from above. A portion 23 forms a seal with lip 10, and a portion 24 forms a seal with spigot 14. Laterally directed apertures 25 are used to evacuate the insert to purge it of air, and then to inject nitrogen into it. During evacuation the insert is sucked onto the tube 22, and held in place. Thus the tube can be used to position the insert in a can.

The tube 22 has a shoulder 26 which engages a flange 27 at the base of the main part of tube 6, to ensure correct positioning.

The overall construction of the insert is such that it is easy to manufacture, easy to assemble, and easy to fill with gas. It is also designed for easy stacking for storage and transportation purposes.

A second embodiment of the invention will now be described with reference to Figures 7 to 15.

The insert 28 is made from two pieces of injection moulded, resilient plastics material 29 and 30, such as food grade high density polypropylene, with a wall thickness of e.g. 8mm. The main, upper part 29 of the insert has a chamber 31 and two diametrically opposed wings 32.

The chamber is defined by a generally cuboid-shaped portion 33 in the centre of which is a hollow tube 34 of tapering circular cross-section.

Below the cuboid portion 33 there is a downwardly extending skirt 35. At the lowermost part of the skirt there is an internal groove 36 which forms part of a snap-fit mechanism which is used to connect the two parts of the insert together in a sealing fashion around their circumferences.

The base of the tube 34 is divided into two coaxial portions 37 and 38 by a step 39. The outer portion 37 is provided with an annular rib 40 projecting from its outer wall. The inner portion 38 defines a hole in the base of the tube 34 and tapers outwardly in the upwards direction. These portions co-operate with parts of the lower piece in a manner discussed below.

The purpose of the wings 32 is to locate the insert within a beverage container such as a beer can. Their outer faces 41 are therefore curved as shown in Fig. 7 and have a similar radius of curvature to that of the container in which the insert is to be used. The wings 32 extend from opposite sides

of the lower part of the skirt 35. Each wing comprises an outer tab 42 attached to skirt 35 by a pair of flexible hinges 43. Thus, each tab can be folded upwardly against the resilience of hinges 43 to permit insertion of the insert into a container. The tabs 42 also have lugs 44 which project below the plane of the hinges 43. Thus, once the insert is in portion the tabs 42 will be pressed against the container walls by the resilience of hinges 43, whilst the lugs 44 will resist movement from this position. As shown in Figure 9, each tab 42 has its outer face 41 cut away at 45 in an arcuate manner. This matches the curvature of portions 46 of the skirt. As a result, during insertion the tabs 42 can be folded up to a vertical position with the cut away portion 45 receiving portions 46 on the skirt.

The main chamber 31 is defined by a portion of generally square shape in plan view, as shown in Figure 7. The sides 47 are joined by curved portions 48. This arrangement facilitates outwards bowing of the walls to absorb initial pressure differential effects in use.

The tabs 42 are provided with apertures 49 to assist the flow of beer during filling of a container provided with the insert.

The second moulded piece 30 forms the base of the insert. It is generally disc-shaped and has an outer skirt 50 with an annular lip 51 which forms a snap-fit into the groove 36 of the main piece 29, with skirt 50 in sealing engagement with the inside of the lower portion of skirt 35 as shown in Figs. 12 and 13.

The second piece 30 has two stable configurations. These are assisted by incorporating an annular groove 52 into the disc which acts as a hinge region and assists the disc to snap between positions. In the first position (as shown in Fig. 12) the disc is bowed outwardly in the downwards direction.

This is an open configuration in which the insert is assembled. In the second configuration as shown in Fig. 13, the disc is bored upwards to a closed configuration. In this closed configuration, pressure within the insert will act on the upwardly bowed portion 53. The resultant force is transmitted to the join between this and the skirt 50, at groove 52 and has a component in the horizontal direction which urges the skirt 50 against the skirt 35 of the other piece. Thus, sealing is enhanced to resist increases in pressure.

In the centre of the disc there is a hollow spigot 54, open at both ends, having an external diameter approximately equal to the interior diameter of the hole through inner portion 38 in the centre of the main piece 29, so that the spigot can form a sealing press fit within the tube. Around the aperture at the lower end of the spigot are projections 55 on the outer face of the disc which are used to space the insert from the base of a container in which it is placed. Spaces 56 between the projections 55 permit the flow of beer during filling.

Disposed around the spigot 54 on the inside face of the disc there are four further projections 57. When the insert is assembled and the disc is in the closed configuration as shown in Fig. 13, grooves 58 on these projections form a snap fit with the rib 40, thus holding the centres of the two pieces together.

The spigot 54 is provided with a longitudinally extending "V" shaped groove 59 shown more clearly in Fig. 11a. This is about 0.3mm deep and has a right angle base. It is this that will provide the orifice for gas and beverage discharge in the manner described below.

An assembled insert with the disc in the open configuration is illustrated in Fig. 12. From this figure it may be seen that the chamber is closed except for the openings provided by the

apertures in the spigot and tube.

Once the insert has been filled with an "inert" gas such as nitrogen, carbon dioxide or a mixture of the two in the manner disclosed below, the second part of the insert is pushed upwards into its second configuration substantially to close the chamber, as shown in Fig. 13. In this configuration the spigot 54 on the second piece fits closely within portion 38 on the first piece, to form a seal around most of the circumference. The exception is that the groove 59 forms a longitudinal, upwardly directed fissure communicating the chamber with the outside. Since the portion 38 tapers, the fissure opens outwardly in the upwards direction.

The grooves 58 on the projections 57 of the lower piece form a snap fit with the rib 40 on the portion 38 of the main part to hold the two pieces together in this "closed" configuration. The projections 57 have spaces between them so that there is free access for beverage and gas within the chamber to reach the groove 59 when the gas and/or beverage is to be ejected.

Below the groove 59 there is a significant volume of the chamber, e.g. 5.4ml for a total internal value of 15.7ml.

The insert is used and operates in the same way as the first embodiment described above, ejecting first beer and then the gas which initiates head formation.

Apparatus for inserting the insert 28 into a can, and for filling it with gas will now be described with reference to Figures 14 and 15.

Figure 14 shows a view of one station for handling the insert 20 and inserting it into a can 60. The apparatus is supported by a bottom plate 61. On this is a pneumatic cylinder 62 carrying a can support 63. The can support has an upwardly domed support piece 64 to support the bottom of a conventional

can which is domed in this manner.

Vertically above the can support 63 is an upper support 65. This is tubular, with a cut out portion 66 on one side. In use, a can 60 is slid into position on the bottom support 63 and through the side cut out 66 of the top support 65. Pneumatic cylinder 62 is then operated to push the can 60 up inside the top support until it engages a shoulder 67. To remove the can eventually the process is reversed.

Above the shoulder 67 is a downwardly tapering insert guide 68 of frustoconical form. At its upper end 69 this has a diameter slightly exceeding that of the insert in its unused state - with the wings 32 fully extended. At its lower end 70 it has a diameter slightly less than that of the opening 71 into the can. The insert can therefore be pushed downwardly through the guide 68, into the can. The wings 32 will fold up and then spring out again when the insert is inside the can, to grip its walls. The insert can be pushed to the bottom of the can but will resist upwards movement again.

The insert 28 is shown mounted on an insertion mechanism 72, the lower end of which is similar in construction to that shown in Figure 6. The insertion mechanism is supported from a pneumatic cylinder arrangement 73 which is used to push the mechanism downwardly and then retract it. The mechanism 72 is shown more clearly in Fig. 15.

The mechanism 72 comprises a top flange 74 which is slidably supported on rods 75 (Fig. 14) connected to the piston rod 76 of pneumatic cylinder arrangement 73, the rods 75 passing through apertures 76 in flange 74. The lower ends of rods 75 are fixed to an outer cylinder 77. Coaxially arranged within the outer cylinder 77 are an inner cylinder 78 and a central tube 79. Inner cylinder 78 is fixed to the top flange 74. A helical spring 80 acts between a shoulder 81 on the inner cylinder 78, and a shoulder 82 on outer cylinder 77. The

central tube 79 is slidably mounted in the top flange 74 and connected at its lower end to a head 83. The head has a flange 84 which engages a stop 85 on the interior of inner cylinder 78. A helical spring 86 extends between the upper surface of this flange 84, and the top flange 74.

The head 83 has a bore 85, a lateral bore 86, an upper frustoconical portion 87, an intermediate portion 88 (with the lateral bore) and a lower portion 89. It may thus engage the insert 28 in the condition shown in Fig. 12, with the upper and lower holes sealed and the lateral bore 86 of the head in communication with the interior of the insert. This is a condition equivalent to that shown in Fig. 6, and Fig. 14 shows the insert 28 in this condition. Gaskets could be used to improve sealing.

The bore 85 in the head 83 is connected sealingly to a gas supply and vacuum pipe (not shown) which passes up central tube 79 and, via a changeover valve, to a vacuum pump and a nitrogen supply.

As shown in Fig. 14, the insert 28 is in place. It is kept in place by applying a vacuum to the bore 85, which both purges the insert of air and holds it onto the apparatus.

To commence the insertion process, the can 60 is pushed up into engagement with the shoulder 67. The insertion mechanism 72 is pushed down by the pneumatic cylinder arrangements 73 so that the insert passes through guide 68, into the can and down to the bottom (which is supported from outside despite its domed shape). During this period the vacuum is maintained. Just as the insert reaches the bottom,i.e. when the projections 55 rest on the bottom, the changeover valve is operated and nitrogen is supplied to the head 83. This passes into the insert through side bore 86.

Downwards motion is now continued. As this occurs, the outer cylinder moves downwardly and presses around the periphery of the upper part of the insert. This pressure causes the lower part to bow inwardly to the closed condition as shown in Fig. 13, forming a sealed snap fit with the other part. During this phase, the outer cylinder moves relative to the inner cylinder through the spring 80, and the head 83 and central tube 79 move upwardly against the spring 86.

Downwards motion is now terminated and the entire mechanism is withdrawn. A stop is used to ensure that the insert cannot be crushed. During the withdrawal period nitrogen continues to be passed through, to ensure that the minimum amount of air is allowed into the can.

The above description is in respect of a single station. In a commercial installation, a number of such station would be provided, e.g. mounted on a turntable.

Instead of using piston/cylinder arrangements, cam tracks could be used to facilitate operation and synchronisation.

After the insert has been positioned, the can is moved by means of a suitable transfer conveyor to another station for filling with beer and sealing. The transfer time should be as short as possible and periods of e.g. 15-20 seconds may be preferred to prevent air entering the can. Dosing with liquid nitrogen at this stage could be effected to reduce problems of air contamination.

Claims

1. A hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so as to promote the formation of foam, wherein the insert comprises first and second portions which are joined together and movable relative to each other from a first position in which there is access to the interior of the insert through at least one relatively large opening provided in one of the portions, to a second position in which the insert is substantially sealed.

2. An insert as claimed in any preceding claim, further comprising means for keeping the two portions together in the second position after filling and being urged together.

3. An insert as claimed in claim 2, wherein the two portions snap or press fit together in the second position.

4. An insert as claimed in claim 3, wherein one of the portions is deformable from a convex dished state in the first position to a concave dished state in the second position in order to help keep the portions engaged together.

5. An insert as claimed in any preceding claim, wherein one of the portions has a relatively large aperture which is positioned opposite a spigot on the other portion, the arrangement being such that when the two portions are pushed together, the spigot enters and seals the aperture.

6. An insert as claimed in claim 5, wherein the relatively large aperture is in the form of a tube and one of the spigot and tube has a longitudinally extending groove which defines, with the wall of the other, a longitudinally extending orifice through which the gas and/or beverage will be ejected.

7. An insert as claimed in any preceding claim, wherein the insert comprises a first portion in the form of a chamber having a first closed end, a central hollow tube extending from the first end to the other end and having an axial opening at both ends, and a second portion in the form of a cap sealed around its periphery to the first portion at said other end, the second portion having a central spigot extending axially into the tube and forming a seal therewith, and there being defined between the spigot and the tube at least one axially extending orifice through which there will be the flow of gas and/or beverage into the beverage in the container when the container is opened.

8. An insert as claimed in any of claims 5 to 7 wherein the spigot is hollow whereby there is provided a passage through the insert.

9. A method of filling with gas a hollow insert for positioning in a container of beverage which is to be sealed under pressure, the insert being adapted to provide a flow of gas and/or beverage into the beverage in the container when the container is opened, so as to promote the formation of foam, wherein the insert comprises first and second portions which are joined together and movable relative to each other from a first position in which there is access to the interior of the insert through at least one relatively large opening provided in one of the portions, to a second position in which the insert is substantially sealed, the filling method comprising the steps of positioning a filling tube through the relatively large opening whilst the portions are in the first position, injecting gas into the insert through the filling tube, moving the portions into the second position, and withdrawing the filling tube from the insert.

10. A method as claimed in claim 9, further comprising the step of evacuating the insert through the filling tube, prior to injecting gas.

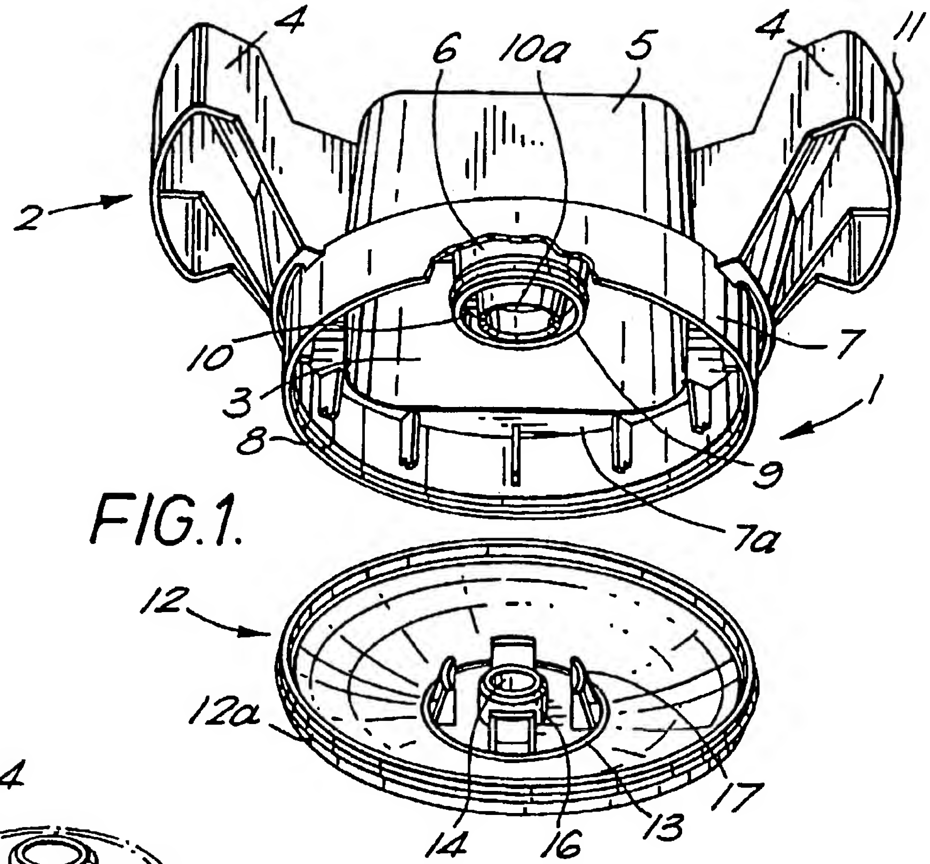


FIG.1.

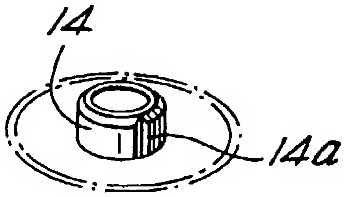


FIG.1a.

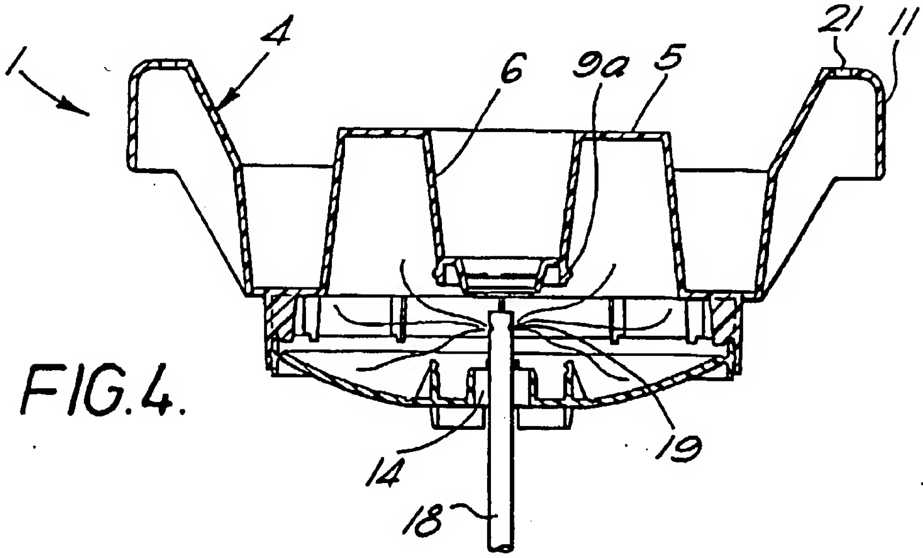


FIG.4.

FIG.2.

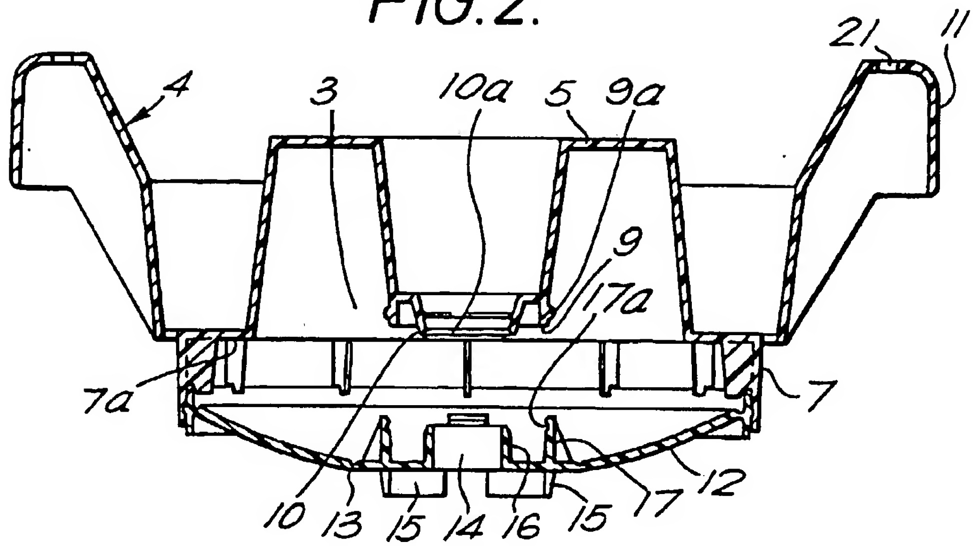
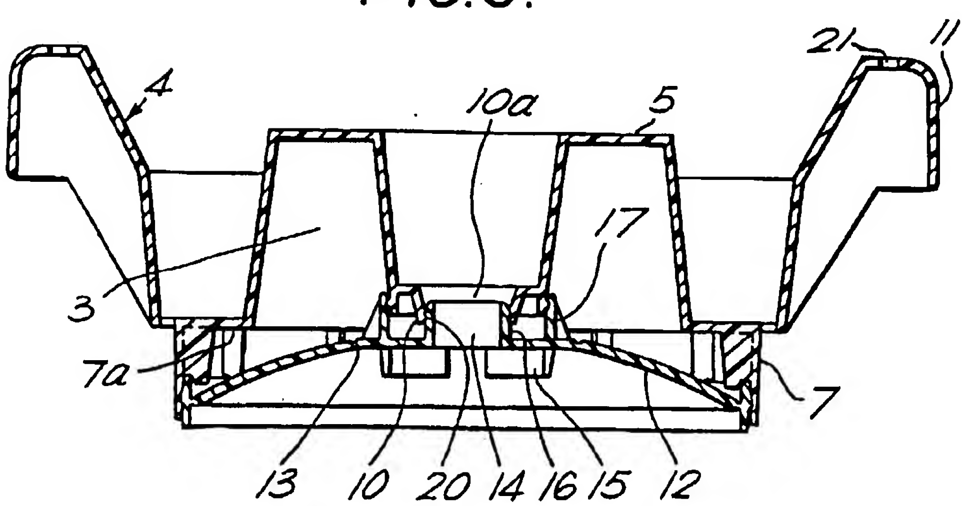

21
11
4
3
10a
5
9a
9
17a
7a
7
12
17
10
13
15
14
16
15

FIG.3.


21
11
4
10a
5
17
3
7a
7
13
10
20
14
16
15
12

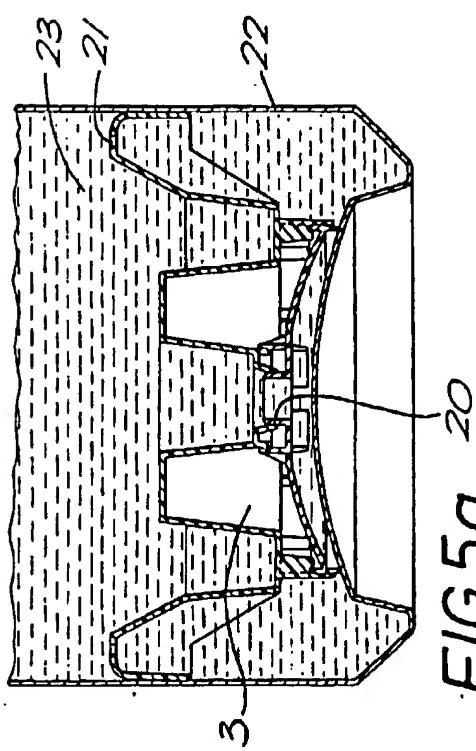


FIG.5a.

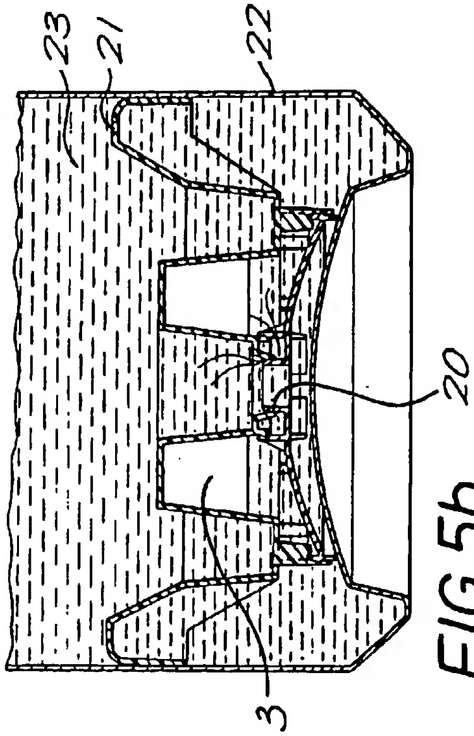


FIG.5b.

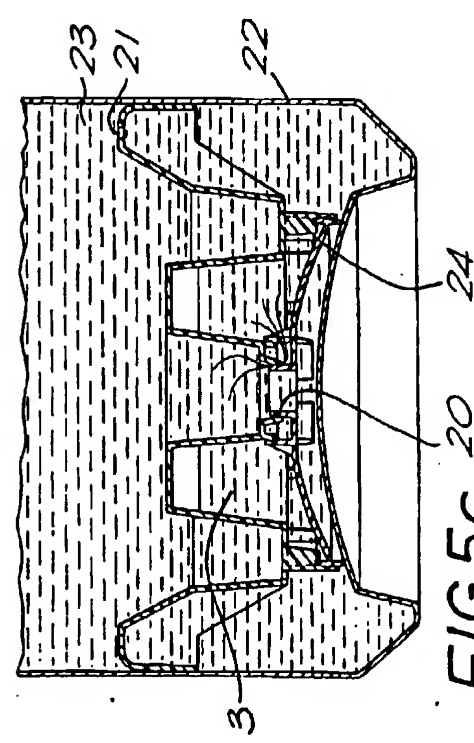


FIG.5c.

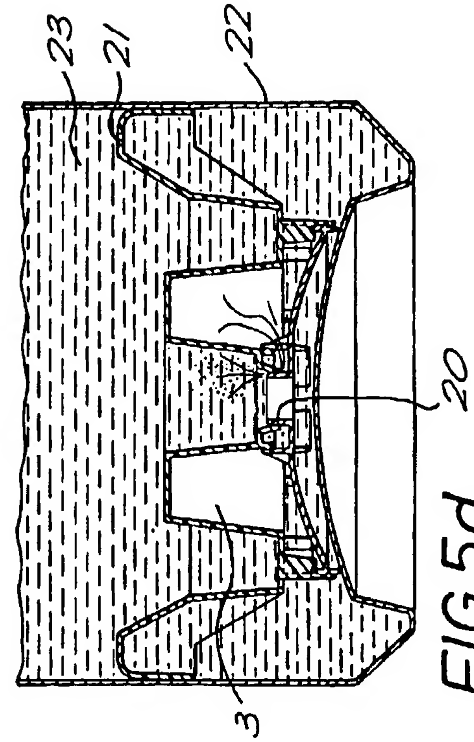


FIG.5d.

FIG.6.

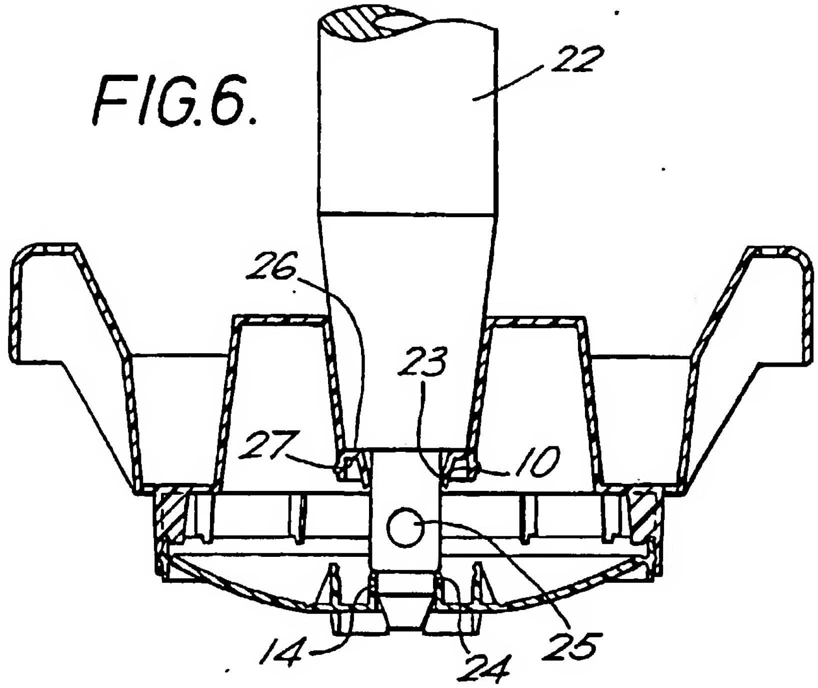


FIG.7.

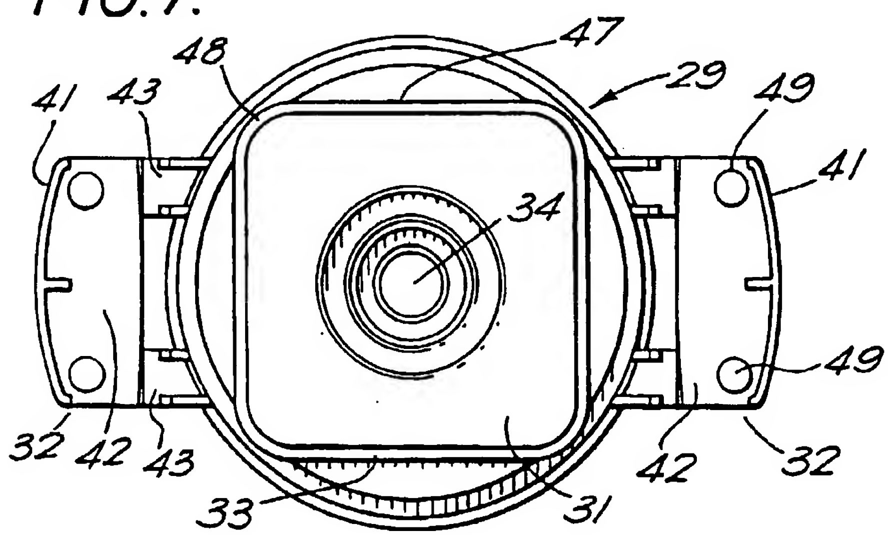


FIG.8.

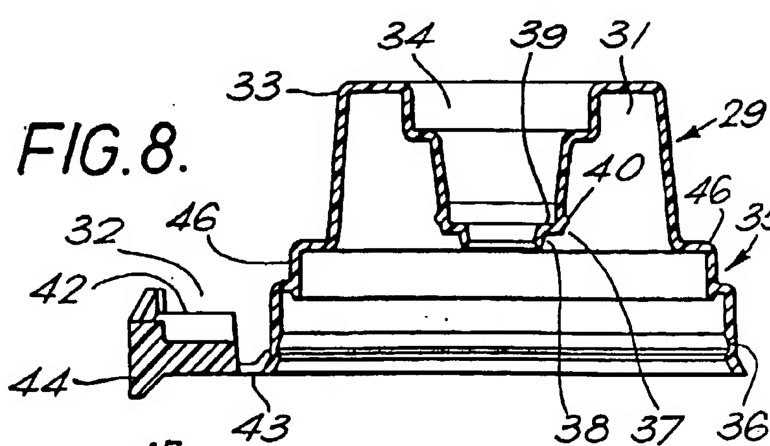
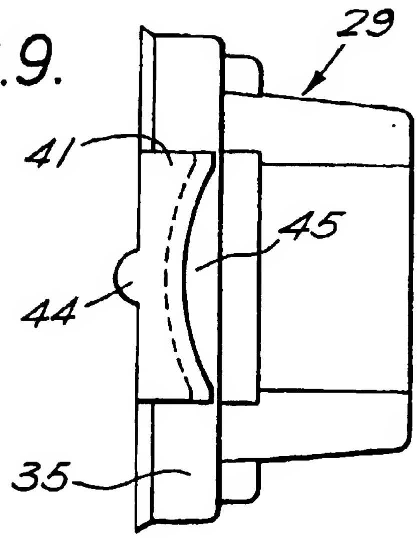


FIG.9.



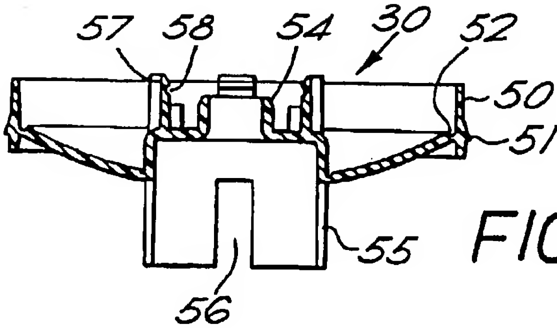


FIG.10.

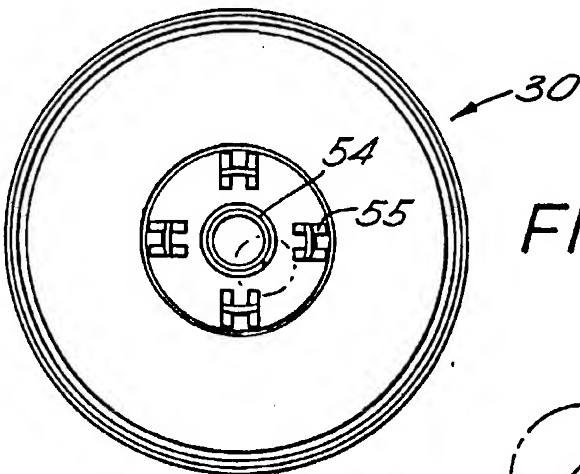


FIG.11.

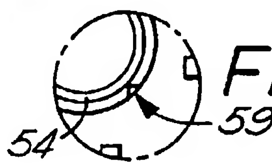


FIG.11a.

SUBSTITUTE SHEET

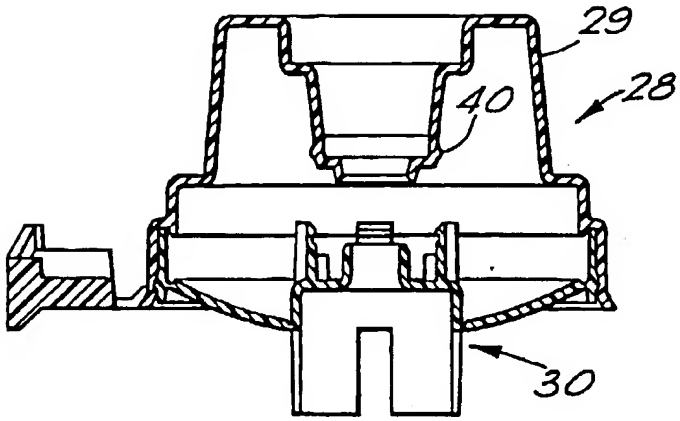


FIG.12.

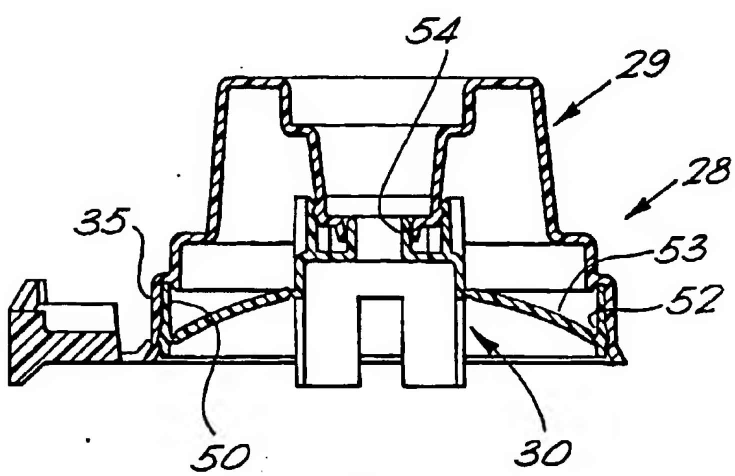


FIG.13.

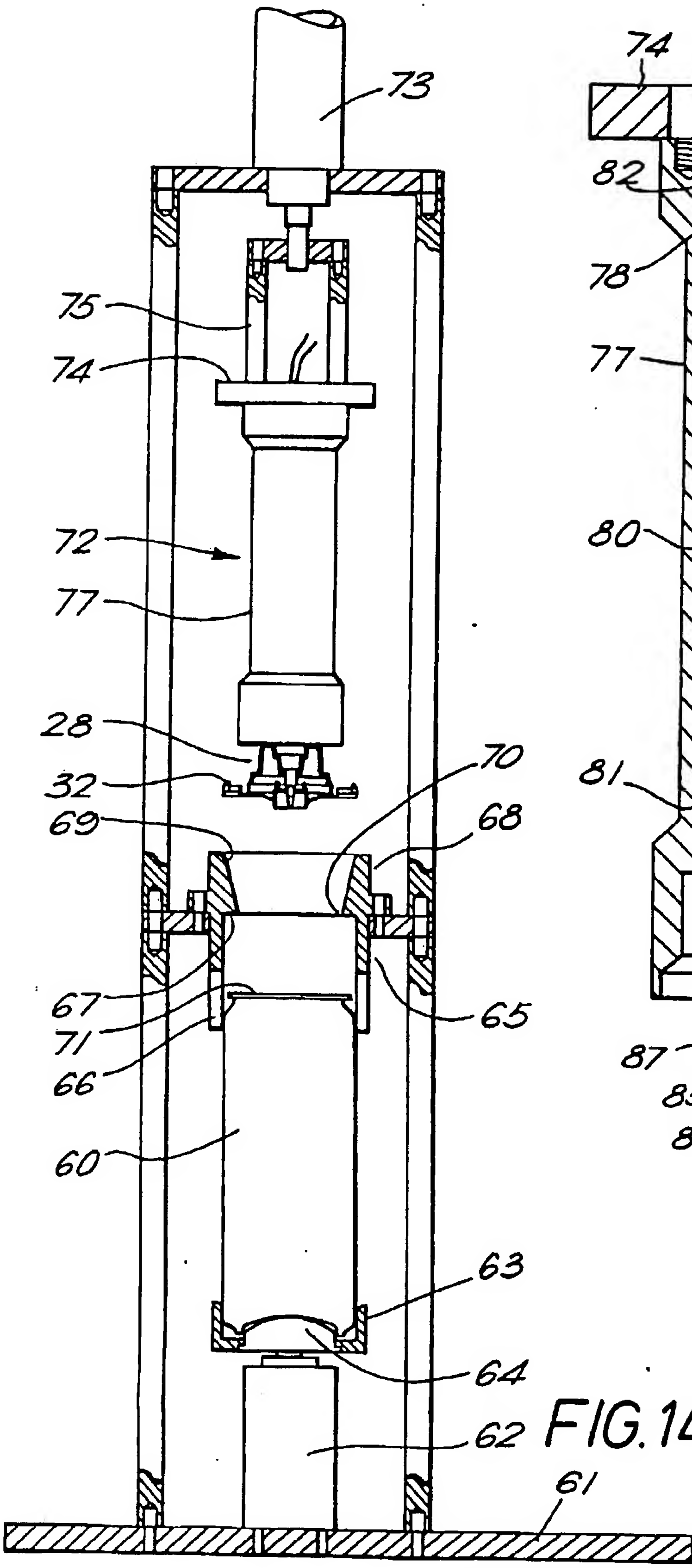

73
75
74
72
77
28
32
70
69
68
67
65
71
66
60
63
64
62
61

FIG.14.

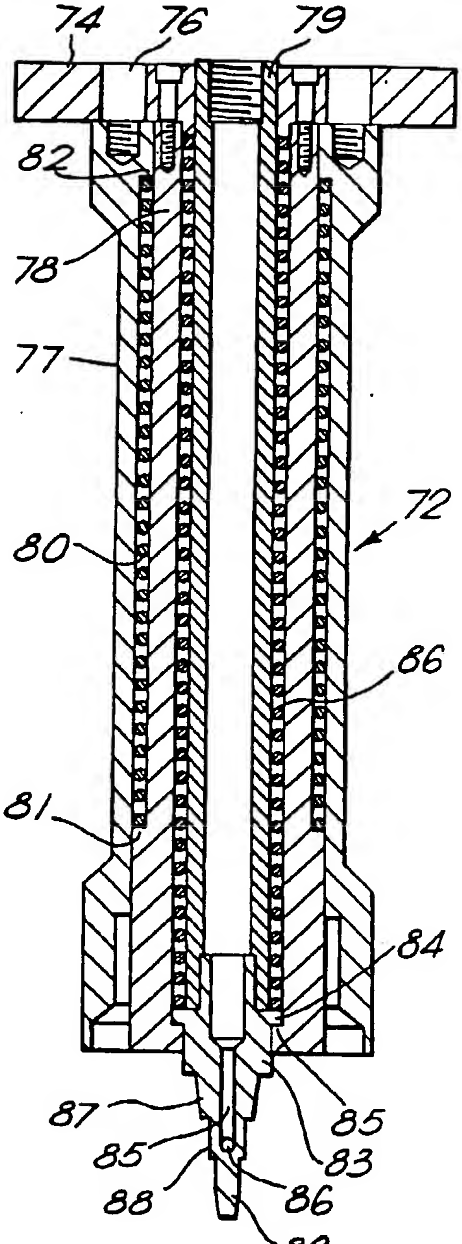

74
76
79
82
78
77
72
80
86
81
84
87
85
85
83
88
86
89

FIG.15.

A. CLASSIFICATION OF SUBJECT MATTER

B 67 D 1/08,B 65 D 25/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B 67 D 1/00,B 67 D 5/00,B 67 C 3/00,B 65 D 25/00,
B 65 D 79/00,B 65 D 85/00,F 17 C 13/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO, A1, 92/00 896 (E.J. PRICE DEVELOPMENTS) 23 January 1992 (23.01.92), claims 1,5-7; fig. 1-6. --	1-4
A	DE, C2, 2 261 762 (LEINBERGER) 18 March 1982 (18.03.82), column 3, last paragraph; column 4, first paragraph; claim; fig.. --	5.
A	EP, A1, 0 184 265 (KONINKLIJKE EMBALLAGE INDUSTRIE VAN LEER BV) 11 June 1986 (11.06.86), page 3, lines 28-31; fig.. --	9
A	WO, A1, 91/07 326	

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 March 1994	26. 04. 94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	BISTRICH e.h.

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages.	Relevant to claim No.
	(WHITBREAD & COMPANY PLC) 30 May 1991 (30.05.91) (cited in the application).	

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/GB 94/00022 SAE 83563

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les reseignements fournis sont donnés à titre indicatif et n'engagent pas la responsibilité de l'Office.

Im Recherchenbericht angeführtes Patentdokument / Patent document cited in search report / Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung / Publication date / Date de publication	Mitglied(er) der Patentfamilie / Patent family member(s) / Membre(s) de la famille de brevets	Datum der Veröffentlichung / Publication date / Date de publication
WO A1 9200896	23-01-92	AU A1 81096/91	04-02-92
		EP A1 537238	21-04-93
		GB A0 9015216	29-08-90
DE C2 2261762	18-03-82	AT B 324792	25-09-75
		DE A1 2261762	20-06-74
		FR A1 2210733	12-07-74
		FR B1 2210733	05-11-76
		GB A 1387226	12-03-75
		NL A 7301234	18-06-74
		NL B 170324	17-05-82
		NL C 170324	18-10-82
EP A1 184265	11-06-86	DE C0 3568153	16-03-89
		EP B1 184265	08-02-89
		ES A1 549436	16-07-86
		ES A5 549436	14-08-86
		ES A1 8609155	16-12-86
		JP A2 61287596	17-12-86
		NL A 8403645	16-06-86
WO A1 9107326	30-05-91	AU A1 68845/91	13-06-91
		AU B2 640435	26-08-93
		CN A 1054399	11-09-91
		CS A3 9005818	18-03-92
		EP A1 502059	09-09-92
		GB A0 9004731	25-04-90
		HU A0 9201699	28-08-92
		JP T2 5507455	28-10-93
		PT A 95974	13-09-91
		ZW A 177/90	01-04-92
		GB A0 9000743	14-03-90
		GB A0 8928892	28-02-90
		GB A0 8926374	10-01-90
		ZA A 9009386	29-01-92
		AU A1 67586/90	24-07-91
		CA AA 2071927	22-06-91
		EP A1 505382	30-09-92
		GB A0 8928899	28-02-90
		JP T2 5502550	28-04-93
		WO A1 9110243	11-07-91